

ABSTRACT OF THE DISCLOSURE

This invention provides compositions and methods for producing translational components that expand the number of genetically encoded amino acids in eukaryotic cells. The components include orthogonal tRNAs, orthogonal aminoacyl-tRNA
5 synthetases, orthogonal pairs of tRNAs/synthetases and unnatural amino acids. Proteins and methods of producing proteins with unnatural amino acids in eukaryotic cells are also provided.